

We claim:

1. A classifier for separating coarse particles from a stream of gas and particles discharged from a vertical mill, the classifier comprising:

a generally cylindrical outer casing having a vertical axis and a vertically oriented sidewall disposed on the mill;

an inner casing arranged within said outer casing, providing an annular passageway between said inner casing and said sidewall through which the stream of gas and particles flows upwardly;

a ring, supported about the axis, comprising a plurality of circumferentially-spaced static vanes forming angled ports for imparting rotational motion to the stream of gas and particles flowing through the ports for centrifugally separating a portion of coarse particles, thereby producing a remaining stream of gas and particles; and

a wheel, supported for rotation about the vertical axis, comprising a plurality of circumferentially-spaced radially extending blades for accelerating the rotational motion of the remaining stream for separating another portion of coarse particles, thereby producing a final stream of gas and particles to be discharged from the classifier,

wherein the portion of coarse particles and the other portion of coarse particles are discharged from the classifier through an outlet for separated particles.

2. A classifier according to claim 1, wherein said ring is supported between said outer casing and said inner casing.

3. A classifier according to claim 2, wherein said ports for imparting rotational motion are horizontally extending.

4. A classifier according to claim 3, said ring further including vertically extending ports.

5. A classifier according to claim 4, wherein said wheel is disposed at a higher level than said ring and the other portion of coarse particles falls downwardly through said vertically extending ports.

6. A classifier according to claim 4, wherein said wheel is disposed at a lower level than said ring and the final stream flows upwardly through said vertically extending ports.

7. A classifier according to claim 5, wherein lower ends of said vertically extending ports are within the inner casing such that the other portion of coarse particles falls through the ports into said inner casing.

8. A classifier according to claim 1, wherein said radially extending blades are vertical and form a generally cylindrical shape.

9. A classifier according to claim 6, wherein said radially extending blades are downward-inclined and form a generally conical shape.

10. A classifier according to claim 1, wherein said wheel rotates in the direction of the rotational motion of the stream of gas and particles, as imparted by the static vanes.

11. A method of separating coarse particles from a stream of gas and particles discharged from a vertical mill, the method comprising the steps of:

(a) passing the stream of gas and particles upwardly through an annular passageway formed between an inner casing and a vertically extending sidewall of an outer casing having a vertical axis and being disposed on the mill;

(b) guiding the stream of gas and particles toward the inner casing through angled ports formed between a plurality of circumferentially-spaced static vanes in a ring supported about the axis to impart rotational motion to the stream for centrifugally separating a portion of coarse particles, thereby forming a remaining stream of gas and particles;

(c) guiding the remaining stream inside a wheel supported for rotation about the axis, the wheel comprising a plurality of circumferentially spaced radially extending blades; and

(d) guiding the remaining stream radially outwardly through openings formed between the radially extending blades to accelerate the rotational motion of the remaining stream for separation of another portion of coarse particles therefrom, thereby producing a final stream of gas and particles,

wherein the portion of coarse particles and the other portion of coarse particles are discharged through an outlet for separated particles.

12. A method according to claim 11, comprising the further step of:
(e) guiding one of the other portion of coarse particles and the final stream through vertically extending ports formed in the ring.

13. A method according to claim 12, wherein in step (c) the remaining stream is guided upwardly inside the wheel, and in step (e) the other portion of coarse particles is allowed to fall to the inner casing through the vertically extending ports.

14. A method according to claim 12, wherein in step (c) the remaining stream is guided downwardly inside the wheel, and in step (e) the final stream flows upwardly through the vertically extending ports.

15. A method according to claim 11, wherein the wheel rotates in the direction of the rotational motion of the stream of gas and particles, as imparted by the static vanes.